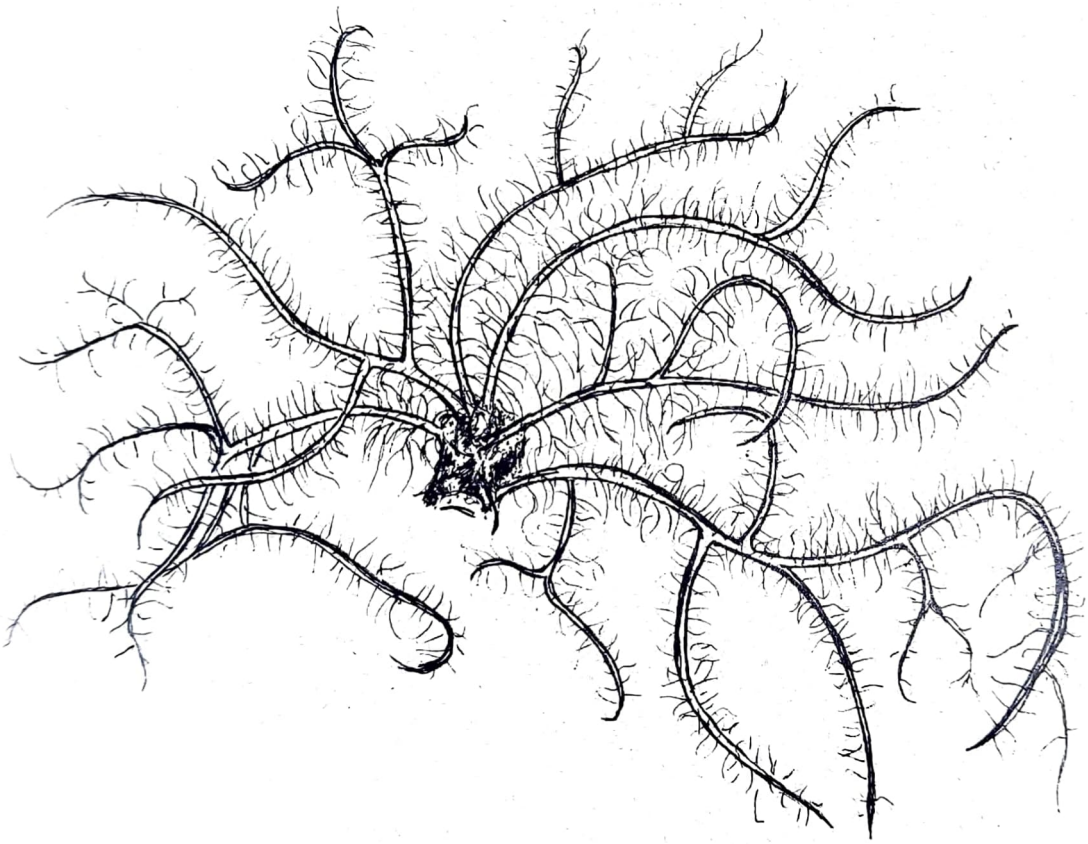
Usnea in the Pacific Northwest

Aide Mémoire



Daphne Fisher Stone

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Aide Mémoire

Daphne Fisher Stone

2018

NORTHWEST LICHENOLOGISTS

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Daphne Fisher Stone received a Ph.D. in ecology at University of Oregon, studying succession of epiphytes on oak branches. She began surveying BLM and Forest Service lands for rare bryophytes and lichens in 1995 and has continued ever since. Winters are spent identifying specimens and studying lichens. She teaches classes on lichens and bryophytes to the public and to Forest Service and BLM botanists. She is President of Northwest Lichenologists and a founding member of Biodiversity Research Collective. She tends a small flock of merino sheep, gardens and knits in Eugene, Oregon.

Hannah Wilson received her M.S. from the University of Oregon in 2012, where she studied the effects of climate change on mycorrhizal associations. She continued there as an Instructor of general biology, and later, as a microbial ecology research technician. She recently shifted gears to focus on biological and children's book illustrations. She spends her free time gardening and renovating her new house in Columbia, Missouri.

Rachel Werling received her M.S. in plant biology from Arizona State University. Her master's thesis is an illustrated flora of native trees and shrubs of Oaxaca, Mexico. She has worked as a botanist extensively in Oaxaca and in the Pacific Northwest. She currently works for Oregon State University Extension in Jackson County.

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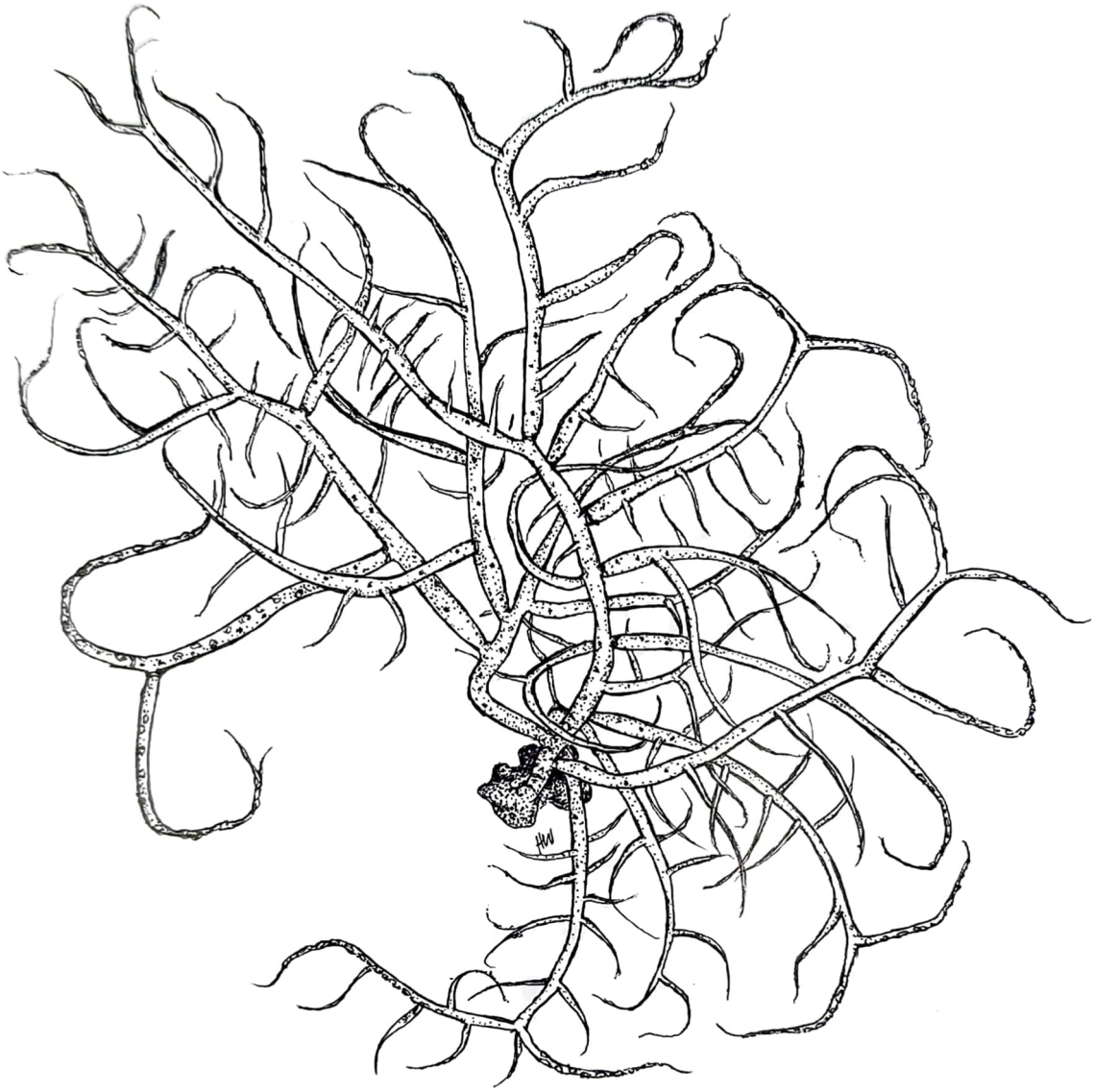
INTRODUCTION

Usnea captured me when I moved to the Pacific Northwest. It is a genus so easy to identify, but with species so difficult to tell apart! *Usnea* species cover our trees, giving wonderful wintertime color and texture and reminding some of Spanish moss, a flowering plant epiphyte of the Deep South. I am asked about *Usnea* more than any other genus, because people are interested in how the species affect garden trees (they don't!), their medicinal properties, and because they are so visible. This booklet is a way of sharing what I have seen and learned over years of working with *Usnea* in the Pacific Northwest. It is based on knowledge gained from looking at specimens that I and others have identified using morphological characters and thin layer chromatography (TLC). DNA sequencing may change many of our species concepts as techniques improve, but for now sequencing remains too expensive to use as an identification tool on every collection, and it is out of reach of the general public.

As this booklet is being written, others are investigating and sequencing *Usnea* all over the world. This work will eventually lead to many changes in our species concepts and names of our local flora. And, of course, these changes will not be a surprise—many of our species were named by early European collectors, who saw similarities to their native species and assumed our species were the same. All of the names we use are hypotheses about relationships with other species, and as we learn more, with new techniques, our hypotheses are updated, resulting in new nomenclature.

Usnea species are highly variable, so when identifying them, do not decide on a species by using a sole character. First, try to find a thallus that has soralia or isidia, so it is mature enough to identify. Look at all the characters and compare them to other possible species. Realize that *Usnea* species are strongly influenced by their microenvironment. California specimens will have more soredia and more compact thalli than those from cooler, moister Pacific Northwest sites. Similarly, *Usnea* collections from polluted areas will have compact thalli with more soralia and isidia than those collected away from pollution sources.

Take your time with *Usnea*, don't expect to be able to identify every collection you make, and enjoy this amazing genus!



Usnea flavocardia

THIS BOOKLET

At the top of each page I give a general statement about where the species is found in the Pacific Northwest, mostly based on *Macrolichens of the Pacific Northwest* by McCune and Geiser (2009). This range is only for the Pacific Northwest, with no statement about where it may be found in the rest of the world. For some species these are quite accurate, while for others that are either less common or more difficult to identify, they are less accurate.

Each page shows several sketches. At the top left is an "icon" intended to show the general growth form. The icons used are tufted and bushy; pendulous without fibrils; pendulous with fibrils; and several with a special form or coloration, including *Usnea lambii, U. longissima,* and *U. silesiaca.*

On the top right is an illustration of a large branch, cut in half lengthwise and also cut across the branch. This shows the relative thickness of the cortex (C), medulla (M), and axis (A), a useful tool for identification. The relationship is recorded as "CMA," the ratio of cortex, medulla and axis. Estimate the thickness of one side of cortex, one side of medulla and all of the axis. Divide each of these estimates by the thickness of the whole branch and these numbers are the CMA. To make CMA %'s add to 100%, you need to double the cortex and medulla estimates. CMA's reported in this booklet for the species are not exact but are mid-range estimates. Note that because they are estimates they do not always add up to exactly 100%.

Below the first two sketches are one or two sketches showing characters on main and secondary branches. A few words indicate characters that are typical of the species, such as soralia shape, isidia, papillae, and dents in the main branches. You may notice that on most species I do not describe branching patterns. This is because most *Usnea* thalli that are collected are not perfect, mature thalli, so branching patterns are not usually obvious.

At the bottom of each page we list similar species and some differences between them and the highlighted species.

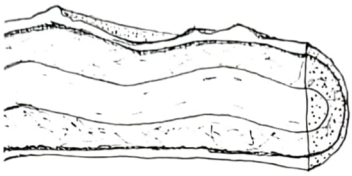
Although spot test reactions are often given for *Usnea*, I find that they are usually less than useful, and I have chosen not to list them for most species in this booklet. First, the tests are often difficult to see; for instance, P test reactions often show up only in the branch tips. Second, most *Usnea* species have several chemical varieties, so that the tests are not at all definitive. Where the chemical tests are helpful, they are included. For more information on spot tests, see McCune & Geiser (2009).

Another character I choose not to include is whether there is blackening at the base of the thallus, where it attaches to its substrate. While this is an important character in other parts of the world, nearly all of our species vary in their base blackening. For those species that never blacken at the base, it is noted.

At the end of the booklet is a glossary.

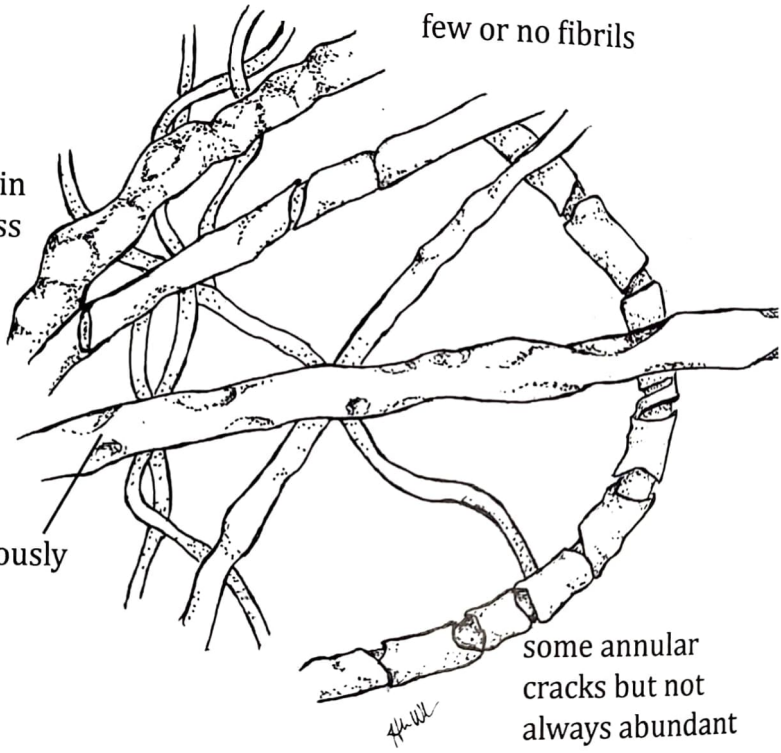
Usnea cavernosa

W of Cascades, locally common



C 7
M 28 loose
A 32 sinuose

to 60 cm long



Similar species:

U. scabrata may be slightly foveolate and have few fibrils and few papillae but has isidia and soredia.

U. subgracilis has no papillae and is only slightly foveolate. It has many annular cracks and a very thin medulla.

U. chaetophora is not foveolate and usually has papillae.

U. trichodea has a reddish or brown axis and conspicuous white, raised annular rings.

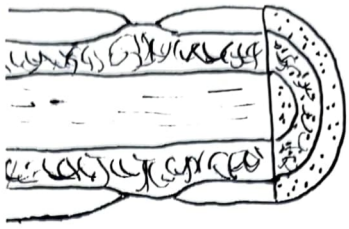
Alectoria sarmentosa and *A. vancouverensis* look similar and are yellowish green, but have many pale, raised pseudocyphellae, no annular cracks or deep dents and no central axis.

Usnea ceratina

oceanic, rare, BC to CA

to 100 cm long

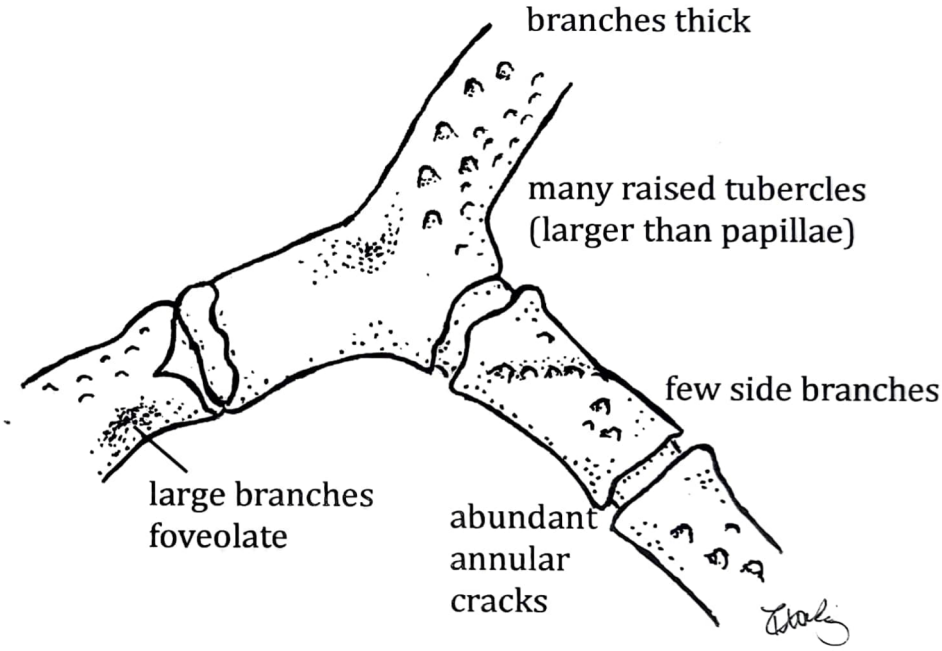
M and A CK+
deep yellow



C 11 uneven, thick and glossy

M 18

A 43 pink to reddish



Similar species:

U. cavernosa has no papillae and branches are conspicuously foveolate.

U. chaetophora is as long but more delicate, with a very thin cortex and white medulla and axis.

U. filipendula and *U. scabrata* are as long but more delicate, with many fibrils, tiny soralia.

U. subgracilis has a white medulla and axis, smooth cortex without tubercles.

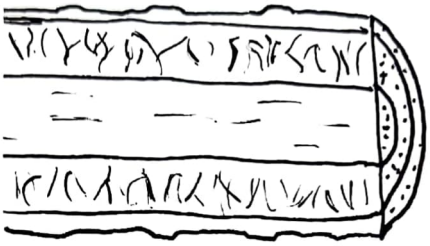
U. trichodea has a reddish or brown axis but slender branches < 0.4 mm wide, with abundant raised, white annular rings.

Alectoria sarmentosa and *A. vancouverensis* look similar and are often yellowish green, but have no annular cracks and no central axis.

Usnea chaetophora

uncommon, BC to OR

low to mid elevations coast ranges and Cascades



C 10
M 19
A 42

few or no fibrils,
thallus to 30+ cm long

abundant annular cracks,
more than 6 per cm

papillae none or
sparse and low

Similar species:

U. cavernosa has no papillae and branches are conspicuously foveolate.

U. ceratina has thicker branches and a pink to reddish medulla and axis.

U. filipendula and *U. scabrata* are as long but more delicate, with many fibrils and papillae and tiny ~~soredia~~. Soralia

U. subgracilis has many annular cracks but no papillae. It may have many fibrils.

U. trichodea has a reddish or brown axis, and white, raised annular rings.

Alectoria sarmentosa and *A. vancouverensis* look similar and are often yellowish green, but have no annular cracks and no central axis.

Usnea cornuta

common on the immediate coast and in wetlands

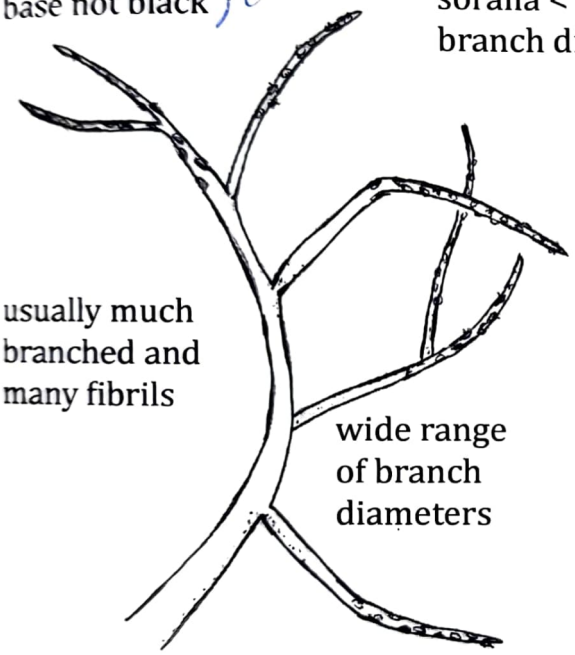
C 7

M 31 very loose, thick

A 25 thin

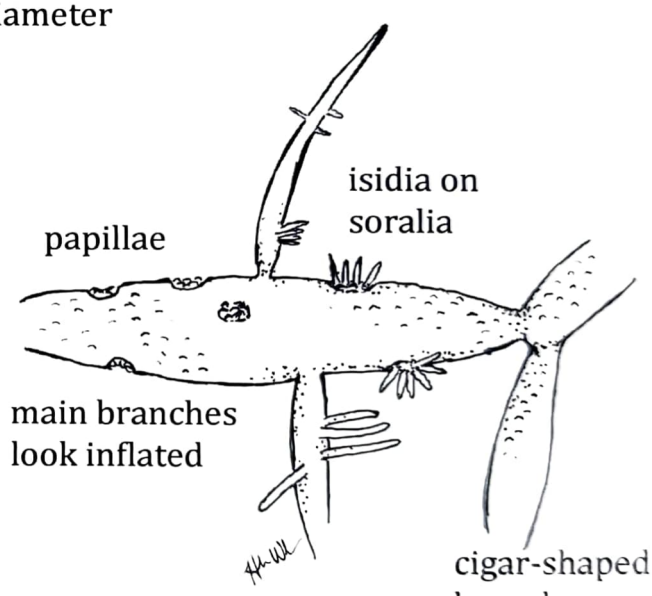
thallus large, 5-15 cm long, base not black, could also be black

soralia < ½ branch diameter



usually much branched and many fibrils

wide range of branch diameters



papillae

isidia on soralia

main branches look inflated

cigar-shaped branches

Usnea cornuta/fragilescens is a group of species that needs further study in the Pacific Northwest.

Similar species:

Four other species with cigar-shaped branches are found in the PNW:

U. glabrata has a more delicate thallus <5 cm long, soralia often > ½ branch diameter, no papillae.

U. flavocardia has a more delicate thallus < 7 cm long, a pale yellow axis, shiny cortex, sometimes with red dots. Soralia often > ½ branch diameter.

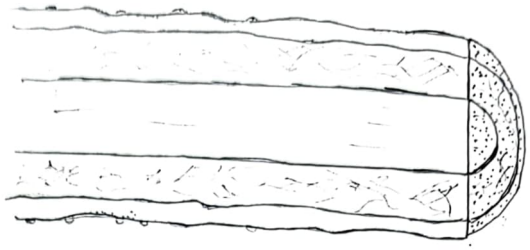
U. fragilescens is similar but has soralia > ½ branch diameter, raised above surface, blackened base, and some thalli are UV+.

U. esperantiana is smaller, tufted or subpendant to about 8 cm long, has lots of papillae, no isidia, soralia become large.

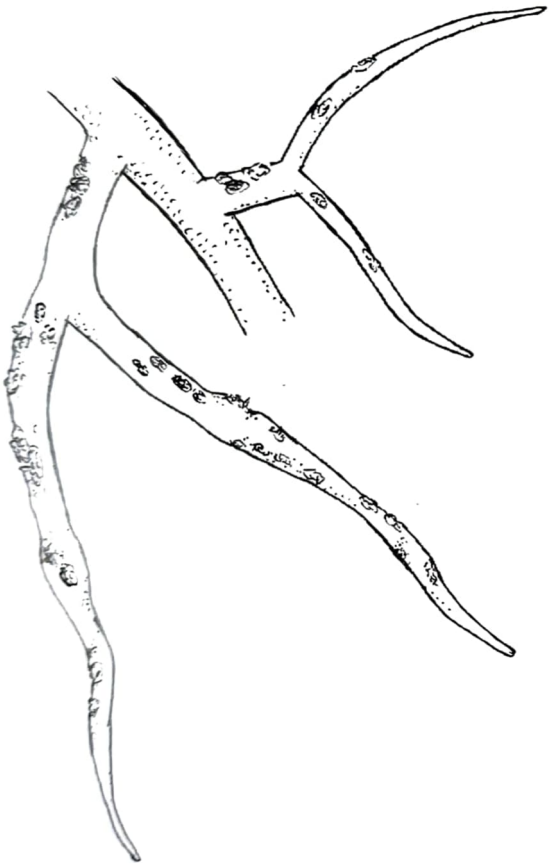
Usnea diplotypus

thallus to ~10 cm long

common W of Cascades,
uncommon E of Cascades



C 8-10
M 23 loose to dense
A 37



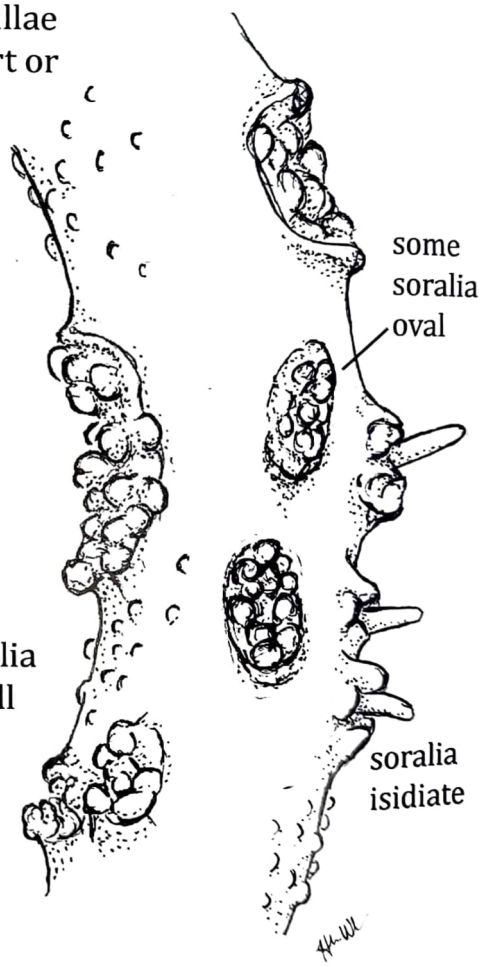
branch tips sinuose

papillae short or tall

some soralia oval

soralia small

soralia isidiate



Similar species:

U. pacificana and *U. subfloridana* are UV+ and have obvious white annular rings.

U. wasmuthii, *U. fulvoreagens* and *U. lapponica* have recurved cortex around their strongly concave soralia, and soralia wrap around the branches with age.

U. nidulans has a glossy cortex and some fibrils are in groups of two to four.

Usnea esperantiana

shrubby to subpendent

to 8 cm long

infrequent to rare, coast ranges and immediate coast

base not black

C 9

M 29 loose

A 26

no isidia

soralia flat to concave, > ½ branch diameter

many distinct papillae

many fibrils

branch tips contorted

cigar-shaped branches

Similar species:

Four other species with cigar-shaped branches are found in the PNW:

U. glabrata has no papillae.

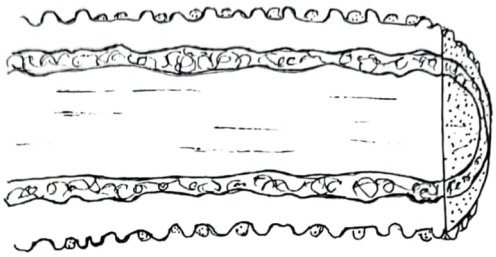
U. flavocardia has a pale yellow axis, shiny cortex, sometimes with red dots.

U. fragilescens also has soralia > ½ branch diameter, but they are tuberculate; is larger and coarser; some thalli are UV+.

U. cornuta is larger and coarser, to 15 cm long, not subpendent, has isidia, soralia < ½ branch diameter.

Usnea filipendula

uncommon, widespread, may be more common N



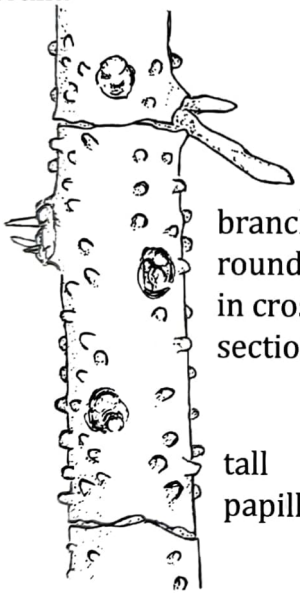
C 16 thicker than medulla

M 9

A 49

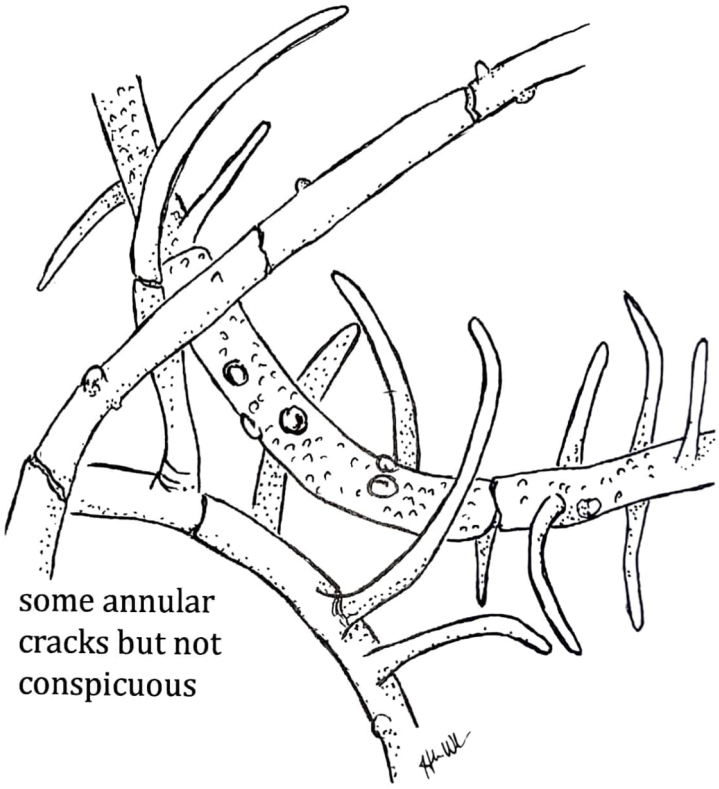
to 30+ cm long, pendulous thallus

isidia and soredia in small tuberculate soralia



branches round in cross section

tall papillae



some annular cracks but not conspicuous

Similar species:

U. scabrata is very similar but branches are uneven and slightly ridged in cross-section (look closely with lens) and the cortex is thinner than the medulla.

U. pacificana can be pendulous but has conspicuous white annular rings and is UV+.

U. ceratina has thick branches and a pink to reddish medulla and axis.

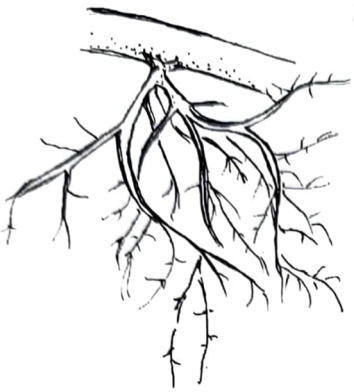
U. chaetophora has many annular cracks and few fibrils.

U. cavernosa has conspicuous foveoles and no isidia.

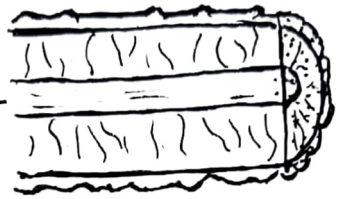
U. silesiaca has broadly divergent branches and many annular cracks.

U. trichodea has reddish or brown axis and conspicuous white, raised annular rings.

Usnea flavocardia



common W of Cascades, especially in low elevations and moist areas



C 9 shiny

M 29 very loose, thick

A 24

thallus small, usually <7 cm

axis yellow, check in several places

see additional illustration on p. 2

often has red dots

cigar-shaped branches

many papillae

soralia when old encircle branches, cortex peels back

Similar species:

Four other species with cigar-shaped branches are found in the PNW.

U. glabrata is a similar size, has cigar-shaped branches, has no papillae, and axis is white.

U. cornuta thalli are larger, branch diameter wider, has cigar-shaped branches, few to no papillae, and axis is white.

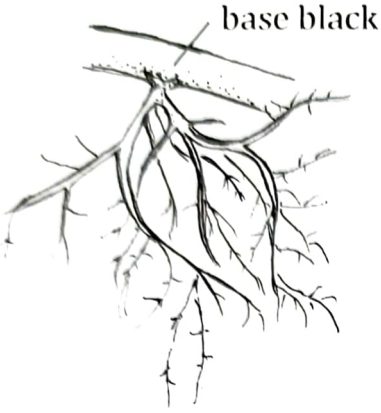
U. esperantiana is about the same size but has a white axis, lacks red dots on the cortex, and is much less common.

U. fragilescens is much larger and coarser, axis is white, cortex is not shiny, papillae are low, and medulla is sometimes UV+.

U. wasmuthii, *U. fulvoreagens* and *U. lapponica* have similar soralia, but do not have yellow axes or cigar-shaped branches.

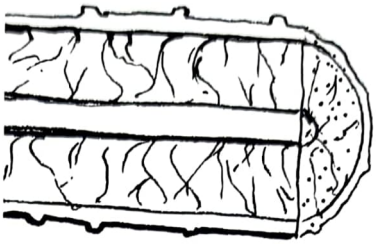
U. subfloridana, *U. pacificana* and *U. diplotypus* do not have cigar-shaped branches and cortex is dull.

Usnea fragilescens



thallus tufted, to 20 cm long

common coastal BC, decreasing to S, common in OR Coast Range



C 7
M 31 loose
A 23

some thalli UV+

sparsely branched, often with few fibrils

soralia > ½ branch diameter

abundant low papillae

wide range of branch diameters

cigar-shaped branches

isidia on soralia

soralia on smallest and secondary branches

Similar species:

Four other species with cigar-shaped branches are found in the PNW:

U. cornuta is very similar but has soralia that are usually < ½ branch diameter and the base is not black.

U. glabrata has a smaller, more delicate thallus, with no papillae.

U. flavocardia has a pale yellow axis, shiny cortex, sometimes with red dots, and is less than 7 cm long.

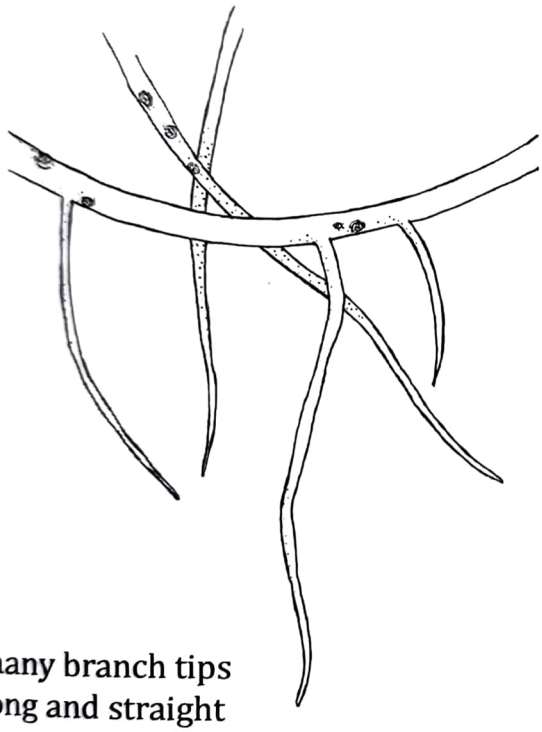
U. esperantiana is tufted or subpendant, smaller, has abundant papillae, no isidia, and soralia become large.

Usnea fulvoreagens

common W of Cascades

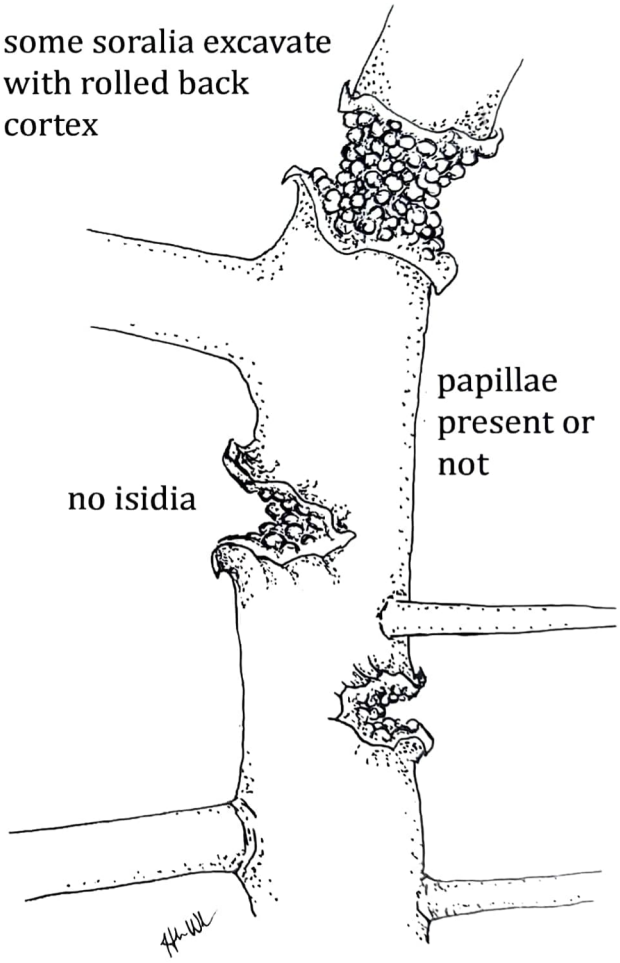
thallus to 20 cm long

C 10
M 22 loose or dense
A 27



many branch tips long and straight

some soralia excavate with rolled back cortex



papillae present or not

no isidia

Similar species:

Two other species without cigar-shaped branches may have this type of soralia:

U. wasmuthii has thick axis, very thin and dense medulla, soralia isidiate when young, some soralia oval with the long dimension parallel to the branch length and papillae.

U. lapponica has a thin axis, loose medulla, papillae, no isidia and branch tips are contorted by soralia.

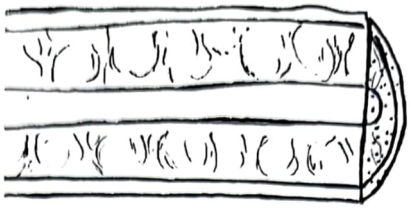
U. glabrata is similar in size and can have excavate soralia but has cigar-shaped branches and has no papillae.

U. flavocardia can have excavate soralia but is smaller, has cigar-shaped branches, and the cortex has red dots. Central cord yellow

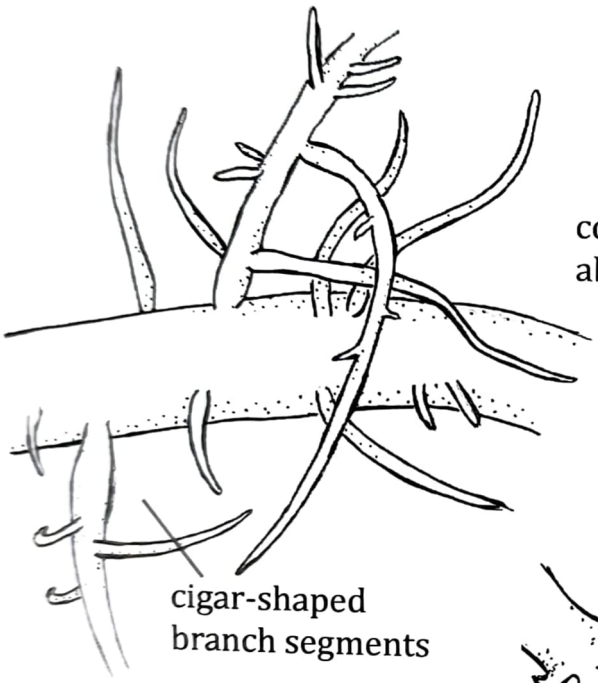
Usnea glabrata

thallus < 5 cm long

common W Cascades, riparian E of Cascades

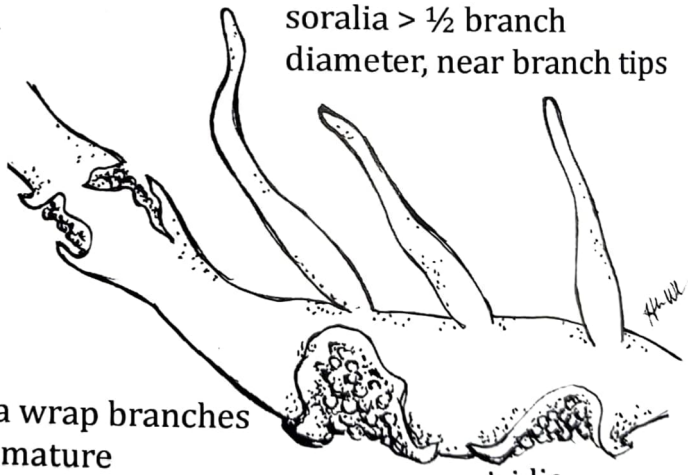


C 8 thin
M 30 very loose
A 24 very thin



cortex smooth, papillae absent or sparse

cigar-shaped branch segments



soralia > ½ branch diameter, near branch tips

soralia wrap branches when mature

no isidia

Similar species:

Four other species with cigar-shaped branches are found in the PNW:

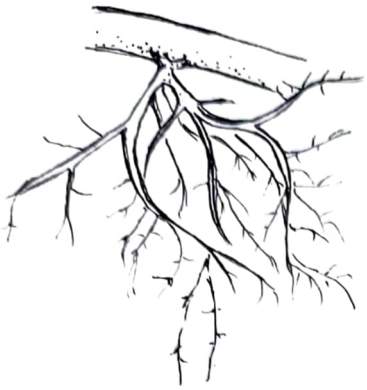
U. cornuta has larger, coarser thallus, distinct papillae, soralia < ½ branch diameter

U. flavocardia is about the same size but has a pale yellow axis and has a shiny cortex, usually with red dots.

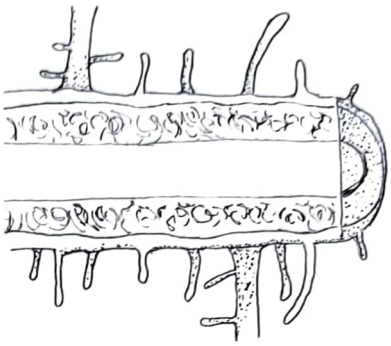
U. fragilescens has larger, coarser thallus, has papillae, and some thalli are UV+.

U. esperantiana is tufted or subpendant, and has abundant papillae.

Usnea hirta

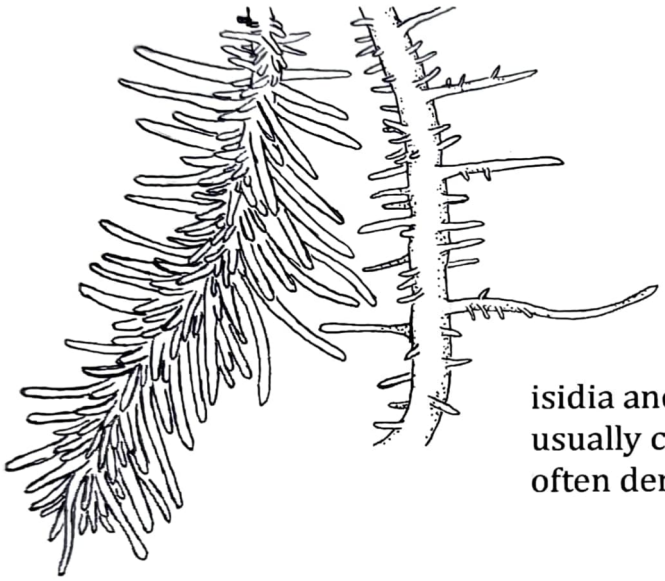


widespread, most common on E side of Cascades, dry forests W of Cascades

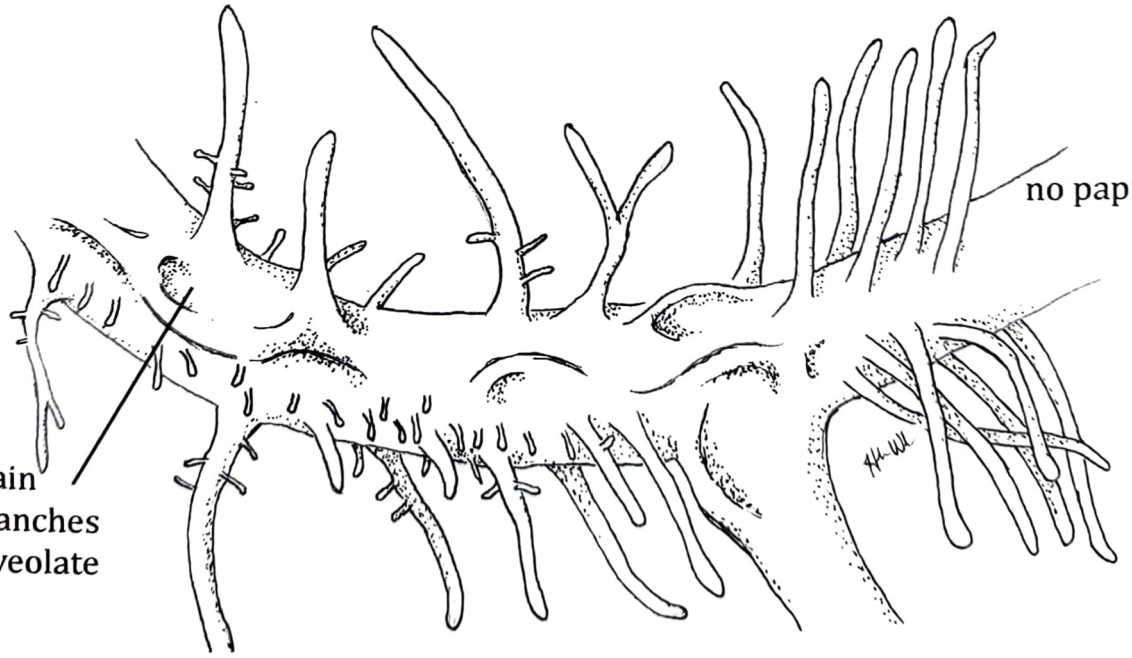


C 9
M 24
A 35

thallus to 10 cm long



isidia and fibrils usually common, often dense



no papillae

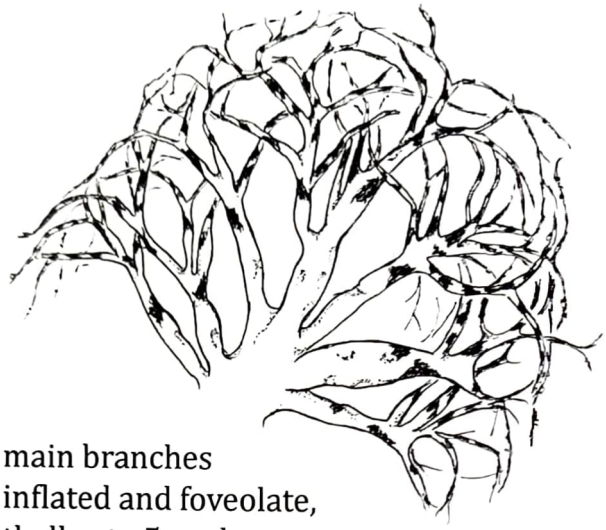
main branches foveolate

Similar species:

This is the only heavily isidiate species.
if isidia are sparse, check for lack of papillae.

Usnea lambii

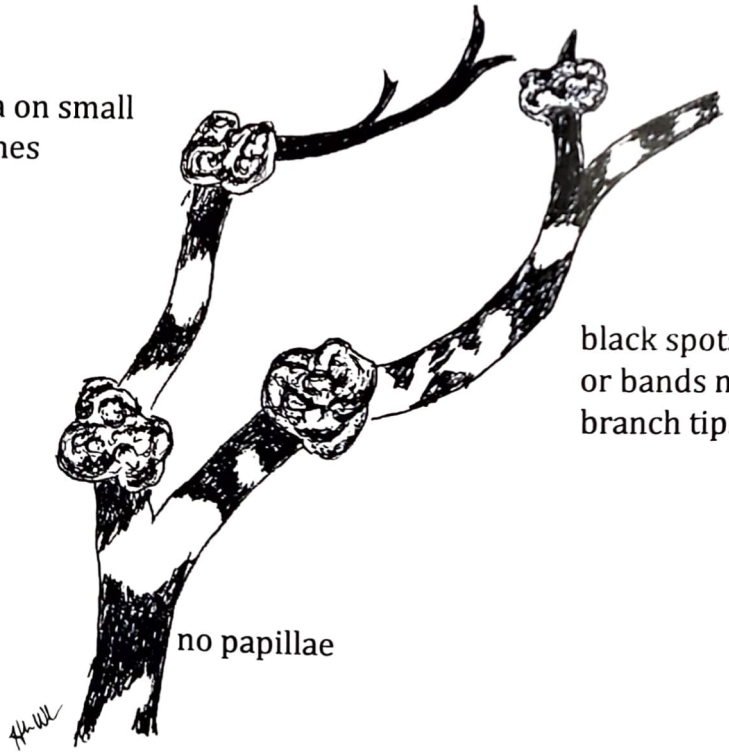
on rock, subalpine and alpine zones on Cascade Mountains in Oregon and Washington



main branches inflated and foveolate, thallus to 5 cm long

C 5
M 30
A 25

soralia on small branches



black spots or bands near branch tips

no papillae

Similar species:

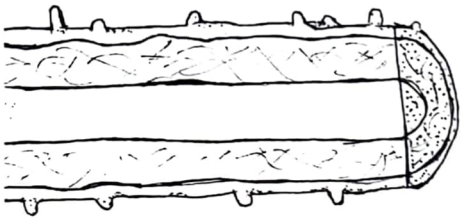
No other *Usnea* lives in this habitat or has the blackened branches and branch tips.

Usnea lapponica

synonym: *Usnea substerilis*

widespread, most common E of Cascades

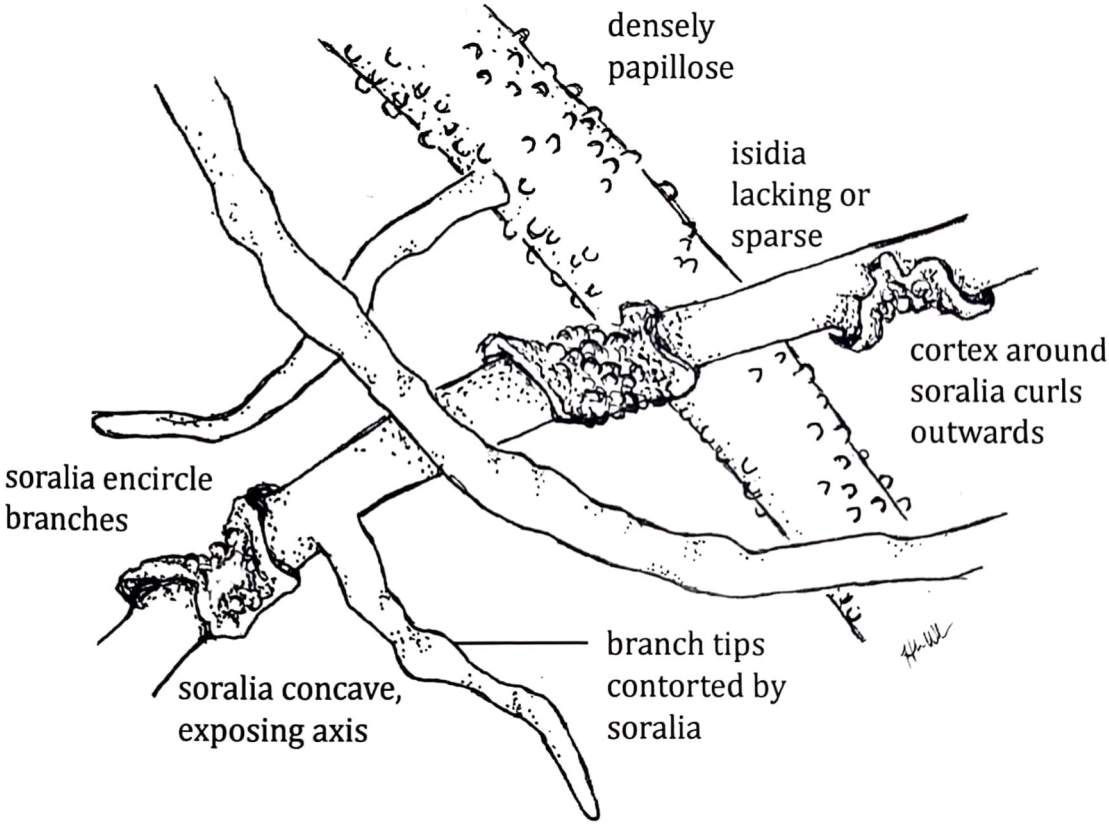
thallus to 8 cm long



C 9

M 28 thick and loose

A 30



Similar species:

Two other species without cigar-shaped branches may have this type of soralia:

U. wasmuthii has much thicker axis, very thin and dense medulla, soralia isidiate when young and some soralia oval with the long dimension parallel to the branch length.

U. fulvoreagens has a thicker axis, soralia not isidiate, many branch tips long and straight without contortions formed by soralia.

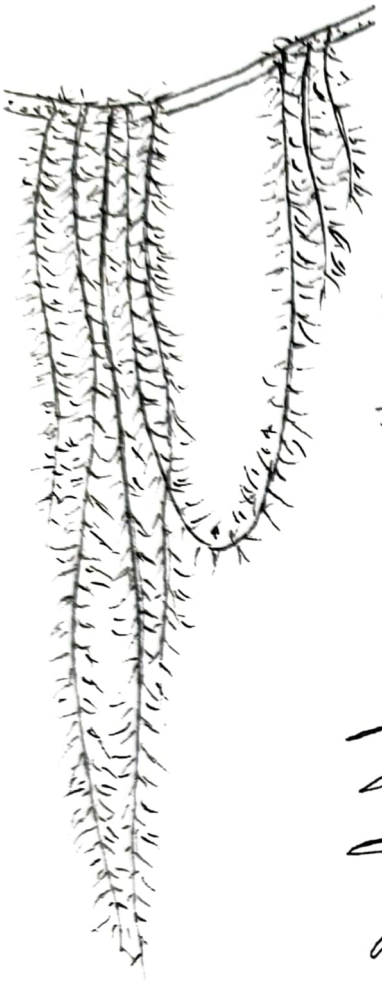
U. glabrata thallus is a similar size and can have similar soralia but has cigar-shaped branches and no papillae.

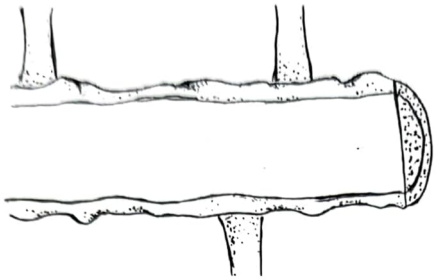
U. substerilis, a confusing, difficult to determine species, was recently determined to be indistinguishable from *U. lapponica* using DNA sequencing.

Usnea longissima

locally common near water or fog-swept areas

longissima means 'the longest'



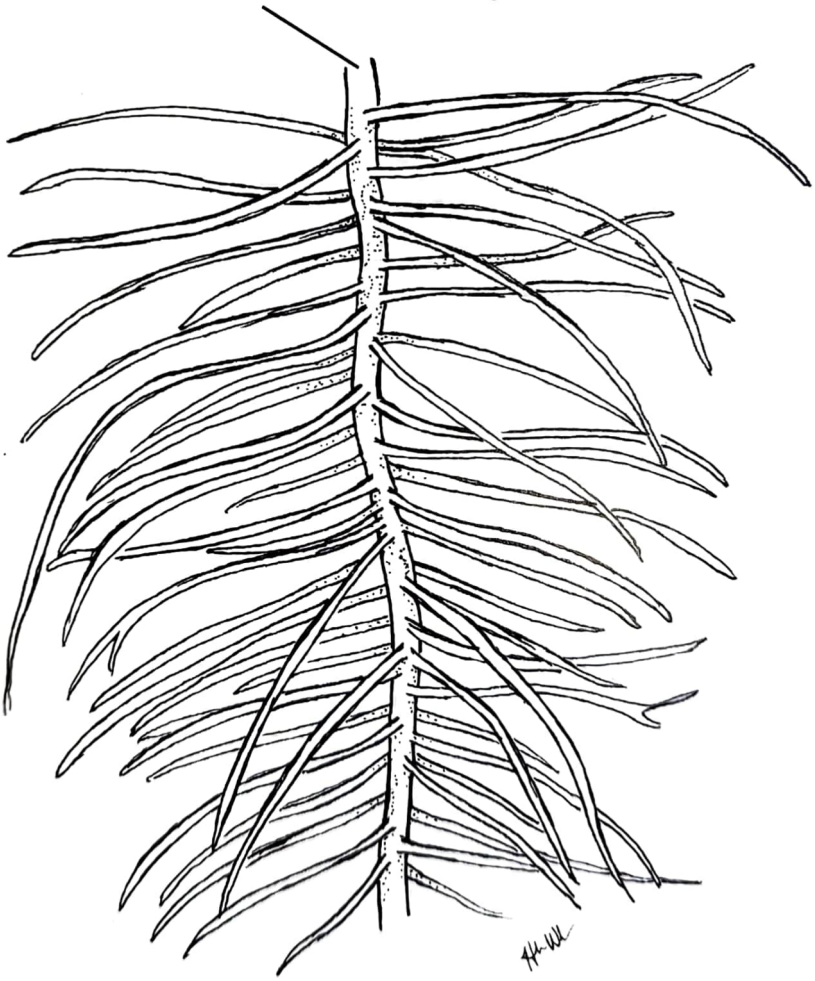


C 0 erodes, usually none visible!

M 10

A 80, I+ blue

no cortex: surface is rough or matte



unbranched thallus to 8 meters long

many fibrils

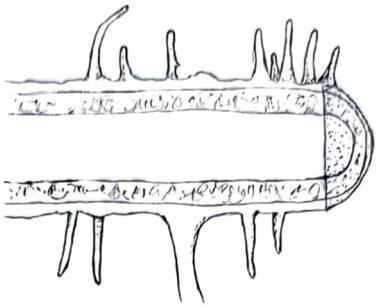
Similar species:

No other *Usnea* looks like *U. longissima*. Look for unbranched thalli that are several meters long, draped from one branch to the next.

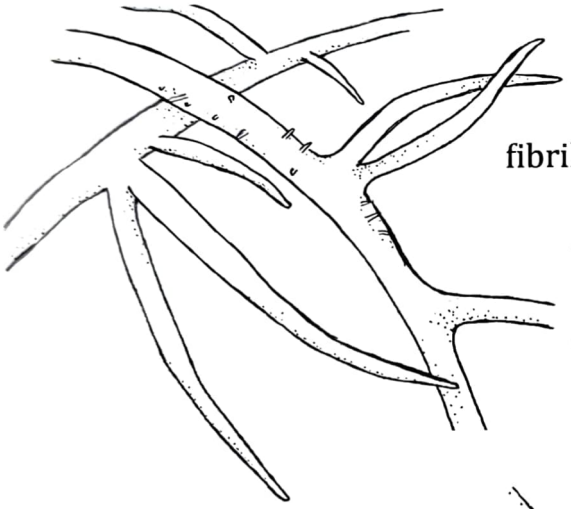
Usnea nidulans

thallus to 10 cm long

BC to Oregon in Coast Range and immediate coast, rare in Oregon

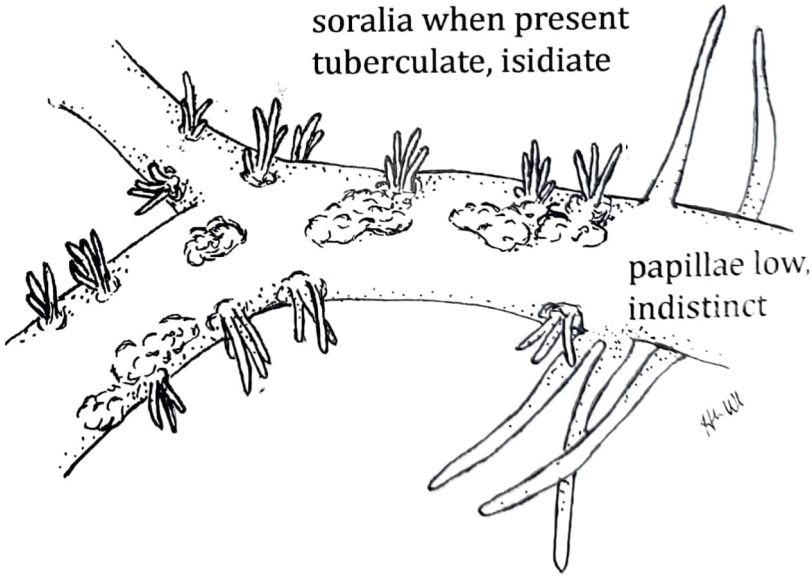


C 9 thin, glossy
M 15
A 55



fibrils often in groups of 2 to 4

branches often have annular cracks or annular rings



soralia when present tuberculate, isidiate

papillae low, indistinct

Similar species:

U. subfloridana and *U. pacificana* have conspicuous white annular rings and distinct, tall papillae. and are UV+

U. diplotypus lacks obvious annular cracks and may have fewer isidia.

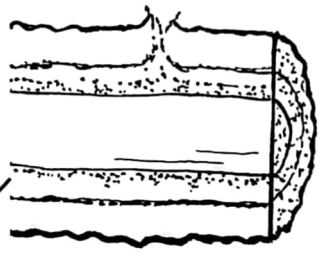
U. wasmuthii, U. fulvoreagens and *U. lapponica* have recurved cortex around their strongly concave soralia, and soralia wrap around the branches with age.

U. hirta has no papillae, abundant isidia, usually abundant fibrils and often is foveolate.

Usnea pacificana

BC to California, widespread W of Cascades

becomes pendulous to 20 cm with age

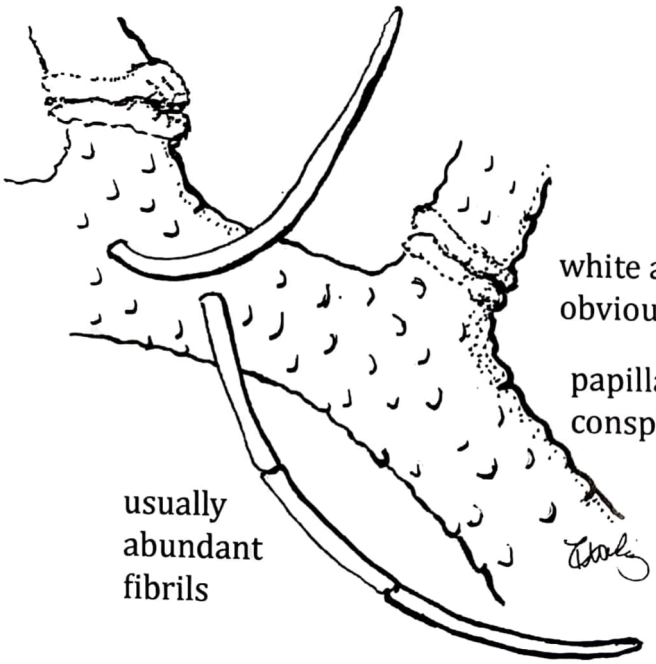


C 19 thick

M 16 usually compact

A 33

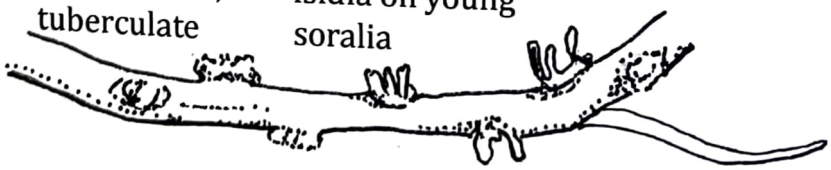
medulla UV+, P+



white annular rings obvious near base

papillae common and conspicuous near base

usually abundant fibrils



soralia small, tuberculate

isidia on young soralia

Similar species:

U. subfloridana is UV+ but usually P–, very similar except it has a thinner cortex and does not become pendulous.

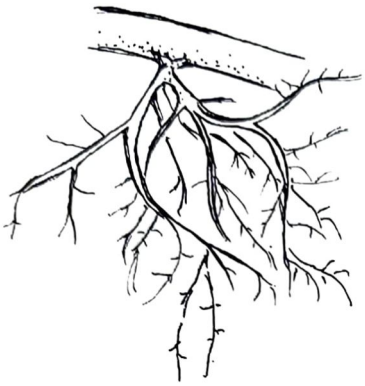
U. diplotypus lacks the obvious white annular rings and does not become pendulous.

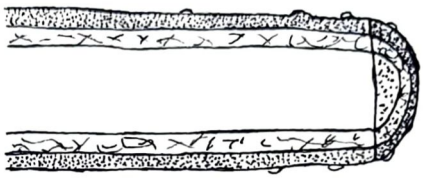
U. wasmuthii, U. fulvoreagens and *U. lapponica* have recurved cortex around strongly concave soralia, and soralia wrap around the branches with age.

U. scabrata and *U. filipendula* are longer and lack conspicuous annular rings.

Usnea rubicunda

near coast to S BC

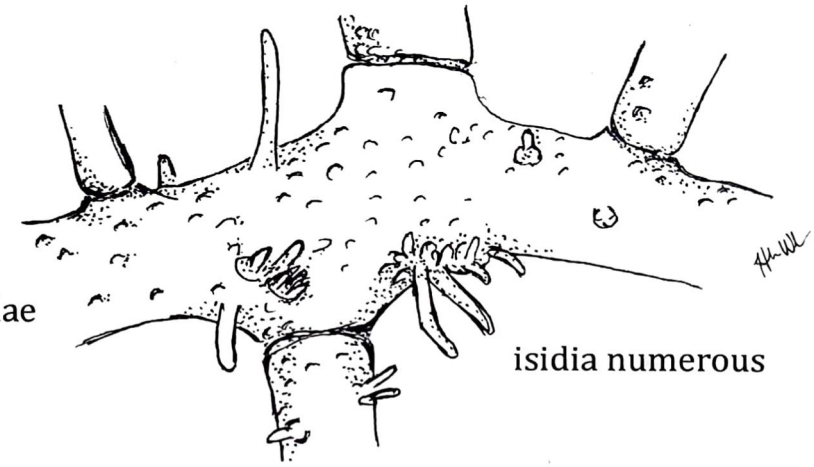




C 14
M 12
A 48

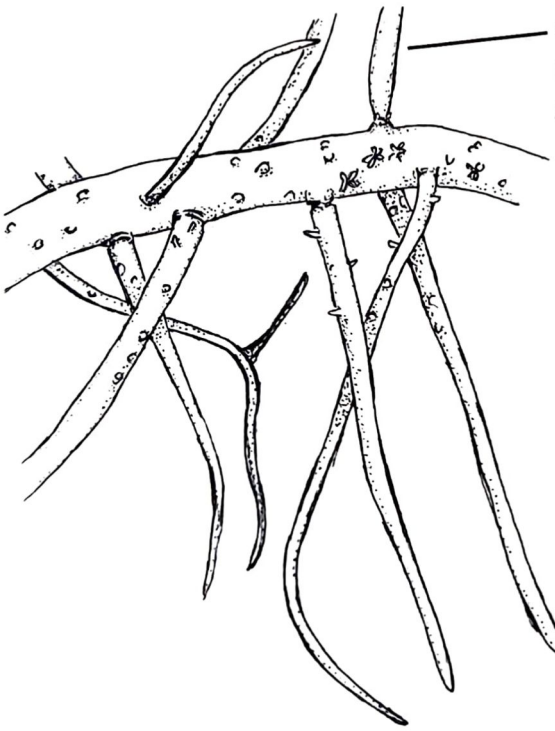
thallus red to reddish brown on at least the lower 2/3 of the thallus when fresh

thallus to 15 cm long



papillae

isidia numerous

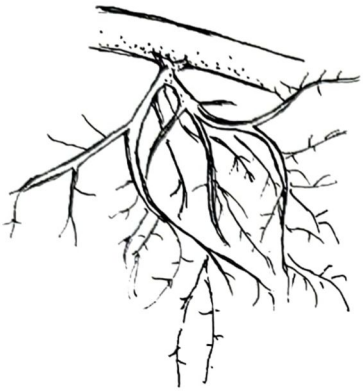


some branches may be cigar-shaped

Similar species:

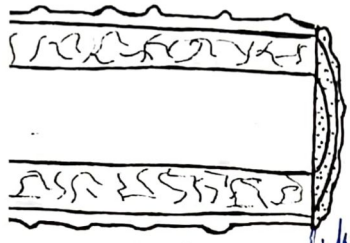
No other species in the PNW has reddish thallus when fresh and healthy. Note: diseased or dying thalli of other species may have red cortex.

Usnea subfloridana



thallus to 15 cm long does not become pendulous

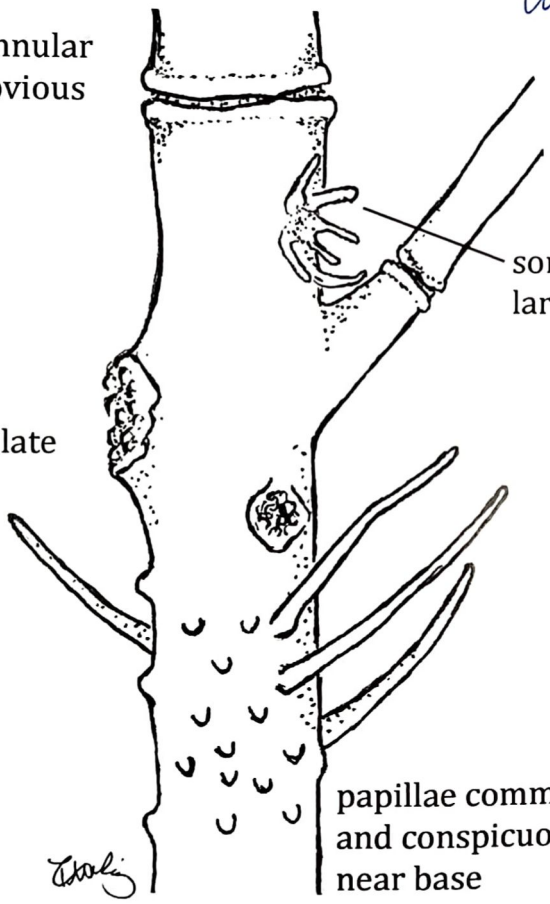
low to mid elevations W of Cascades, possibly more common N



C 10
M 20
A 40

medulla UV+, P– or P+

UV+ or UV– with thamnolic acid



white annular rings obvious

soralia small to large, isidiate

soralia tuberculate

papillae common and conspicuous near base

Similar species:

U. pacificana is UV+, very similar in most characters except it has a thick cortex and can become pendulous.

U. diplotypus lacks the obvious white annular rings, may have fewer isidia and is UV–.

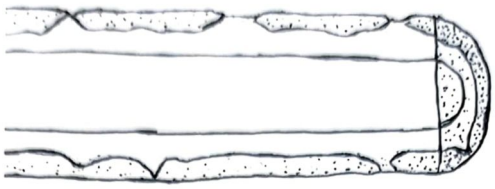
U. wasmuthii, U. fulvoreagens and *U. lapponica* have recurved cortex around their strongly concave soralia, soralia wrap around the branches with age, and medullae are UV–.

Usnea subgracilis

base not black, thallus to 50+ cm long

synonyms: *U. hesperina*, *U. schadenbergiana*

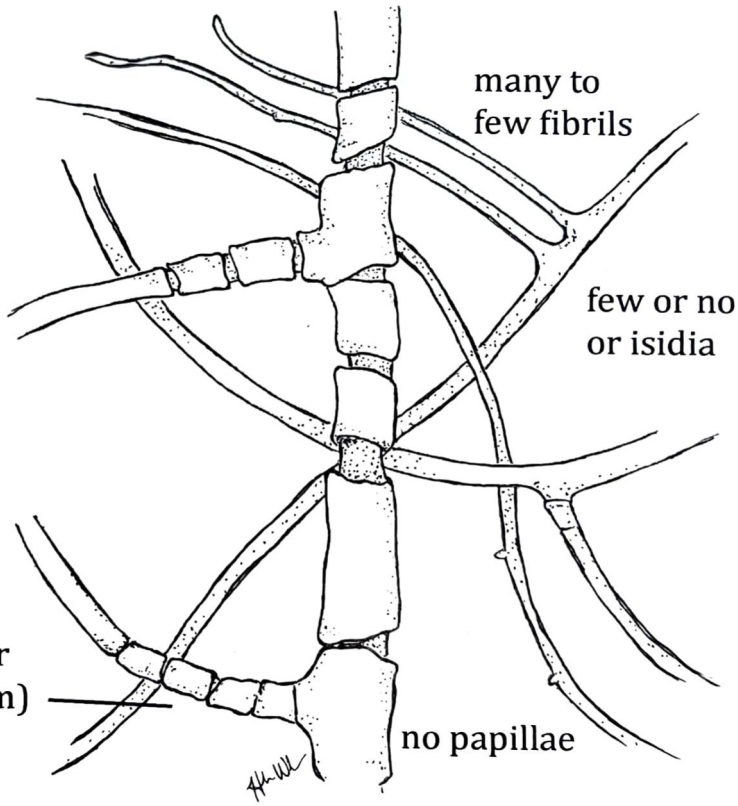
immediate coast, BC to Mexico, locally common in limited habitat



C 15

M 6-15 as thin or thinner than cortex

A 38 thick



Similar species:

U. chaetophora has many annular cracks and no papillae, but the medulla is thicker than the cortex and it usually has papillae. The base is slightly to distinctly blackened. It grows in the coast range, not on the immediate coast.

U. scabrata can have few papillae but usually has fibrils and many isidia.

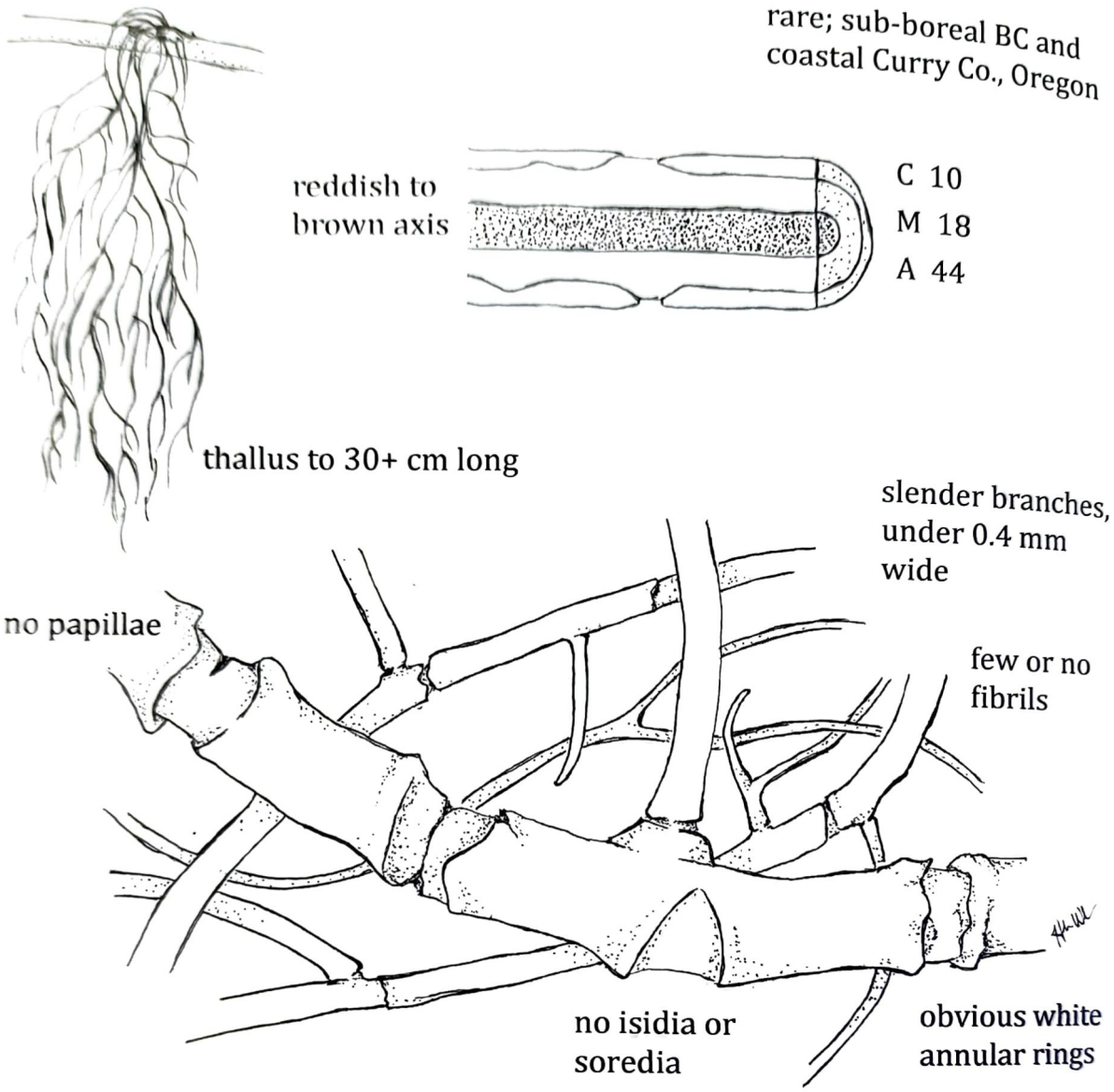
U. cavernosa is obviously foveolate.

U. ceratina has a reddish medulla and axis and main branches are very wide with soralia and isidia on raised tubercles.

U. trichodea has a reddish or brown axis and raised, white annular rings.

Alectoria sarmentosa and *A. vancouverensis* look similar and are often yellowish green, but have pale, raised pseudocyphellae, no annular cracks and no central axis.

Usnea trichodea



Similar species:

U. subgracilis is also found on the coast and has no papillae and few or no fibrils. It has abundant annular cracks but they are not enlarged and white, and the axis is white.

U. ceratina has a reddish, pink or brownish axis but has tubercles with isidia and soredia and is oceanic.

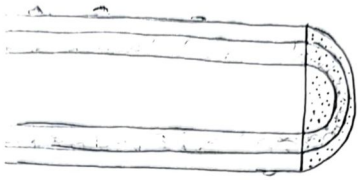
U. scabrata is slightly foveolate and has fibrils, papillae, isidia and soredia.

U. chaetophora has a white axis, usually has papillae and can have some small and tuberculate soralia.

Alectoria sarmentosa and *A. vancouverensis* look similar and are often yellowish green, but have pale, raised pseudocyphellae, no annular cracks and no central axis.

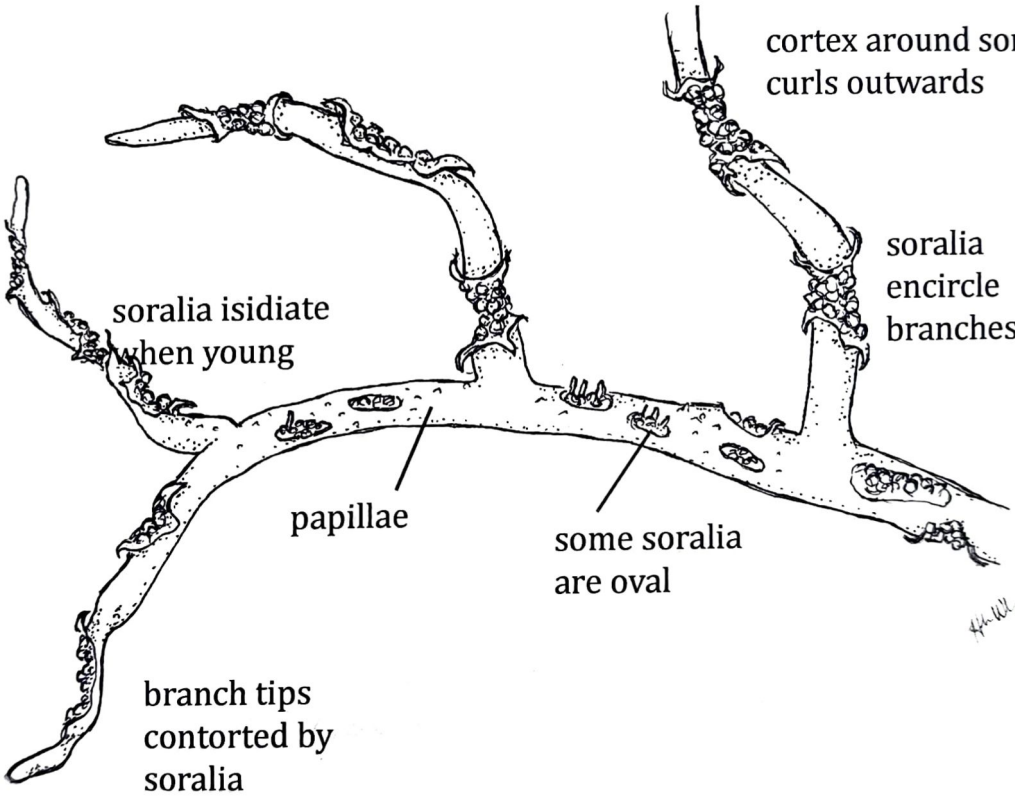
Usnea wasmuthii

Range not well known; rare in Washington, more common S



C 11
M 13 dense
A 43

thallus to ~10 cm long



Similar species:

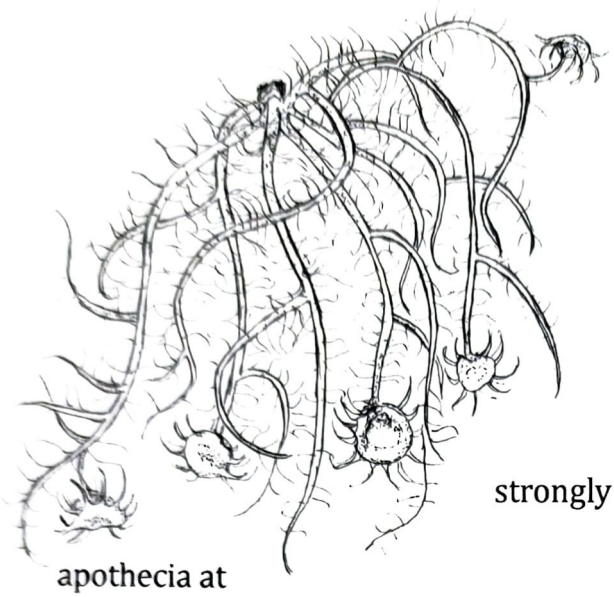
Two other species without cigar-shaped branches may have this type of soralia:

U. lapponica has thin axis, loose medulla, papillae, no isidia and branch tips are contorted by soralia.

U. fulvoreagens has a thick axis, is papillose or not, no isidia and many branch tips long and straight without contortions formed by soralia.

U. glabrata has cigar-shaped branches, no papillae, thallus is a similar size, can have similar soralia.

fertile ***Usnea*** species



U. intermedia, U. quasirigida and *U. florida*

rarely found in Oregon and Washington

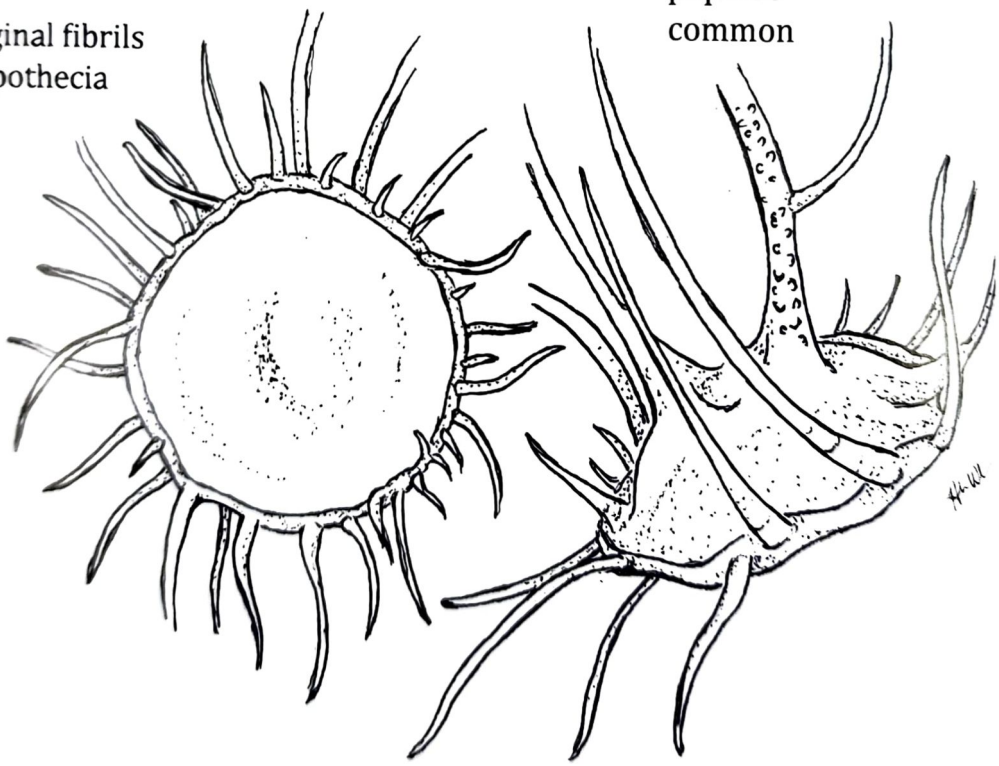
Other species may rarely have apothecia, look for soredia and isidia; if present, see elsewhere in this booklet.

strongly fibrillose

apothecia at branch tips

marginal fibrils on apothecia

papillae common



Similar species:

Typically fertile species possible in PNW:

U. intermedia medulla K+ yellow to orange, P+ orange

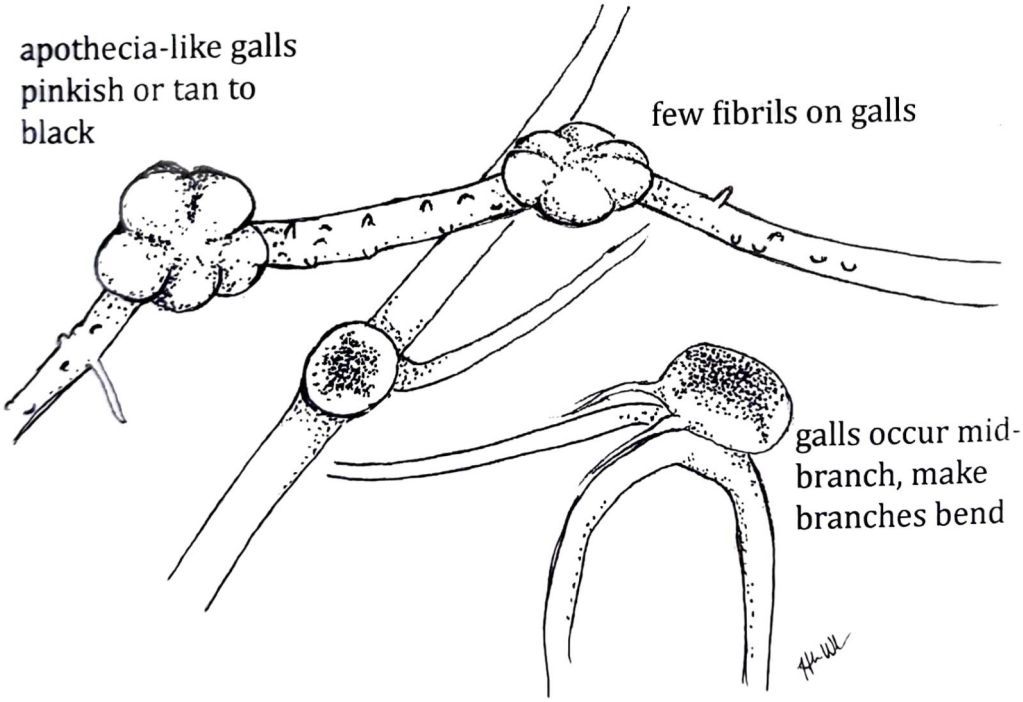
U. quasirigida medulla K–, P+ orange-red

U. florida medulla K– P– , UV+ or K+ deep yellow, P+ orange, UV–

parasitic species on ***Usnea***

parasitic species forming apothecia or apothecia-like galls on *Usnea*

- found on many species of *Usnea*
- represent several different parasitic genera including *Biatoropsis* and *Tremella*. *Abrothallus* and *Lichenoconium* species often parasitize these galls.



GLOSSARY

For example illustrations, see species indicated in curly brackets {...}.

annular cracks: obvious cracks in cortex that ring the branch. I distinguish cracks that have puffy white medulla visible by calling them annular rings. {*subgracilis*}

annular rings: obvious cracks in cortex with puffy white medulla visible. {*pacificana*}

apothecium (plural apothecia): fruiting body that produces spores of the fungus. These spores must land in an appropriate habitat and find an alga to become a thallus. {fertile species}

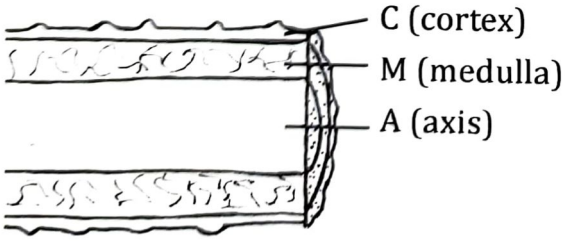
axis: strand of dense fungal hyphae in the center of *Usnea* branches (see figure below). When thallus is wet, pull gently and the cortex and medulla will break as the elastic center strand stretches.

branching: 1° branches are the main branches, 2° branches come off of the main branches.

cigar-shaped branch segments: branches pinched at the base. This is sometimes subtle, inspect the whole thallus. Most *Usnea* with cigar-shaped branches have very loose medulla around a thin axis. {*cornuta*}

CK spot test: first apply C then apply K and watch for color reaction

CMA: the ratio of the thickness of cortex to medulla to axis. Cut the branch in half along the long dimension then estimate the thickness of one side of cortex, one side of medulla and all of the axis. Divide these estimates by the thickness of the whole branch and these are the CMA. To make CMA %'s add to 100%, you need to double the cortex and medulla estimates. CMA reported for the species are not exact but are mid-range estimates, and because of this they do not always add up to exactly 100%.



	Raw	Ave.	%
C			
M			
A			
M			
C			
Total			

"Raw" = scope micrometer units.

"Ave" = average 2 C's, 2 M's, copy A.

"%" = 100×Ave./Total

coastal: along the immediate coast or in the coast range.

confluent soralia: soralia that join each other as they grow, often becoming a ring around the branch.

contorted branch tips: branch tips that twist and curl, usually due to soralia formation. {*esperantiana*}

cortex: dense fungal tissue made of cells with thick walls. The cortex in *Usnea* is usually hard and smooth, sometimes shiny. See figure on preceding page.

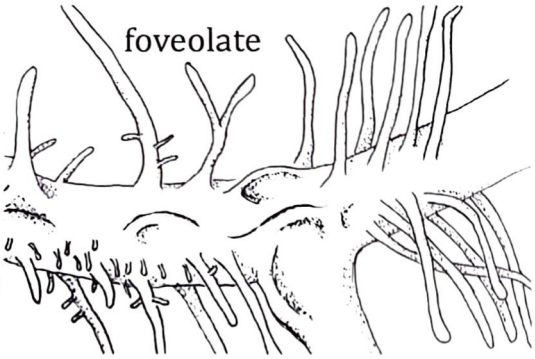
divergent branches: branches grow in all directions, not at all parallel. {*silesiaca*}

excavate soralia: soralia that begin on the branch surface and become deeper in the medulla as they age, so deep they expose the axis in some species. {*fulvoreagens*}

fibrils: short, narrow projections growing at right angles from the branches, that are much smaller than branches. {*longissima*}

fibrillose: with many fibrils.

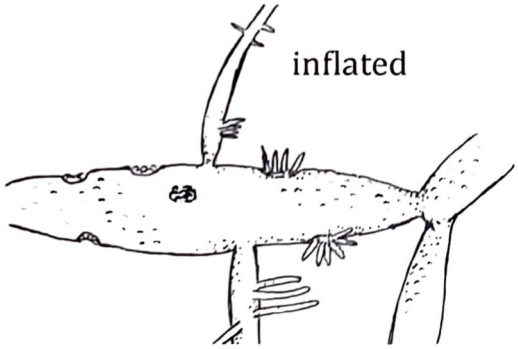
foveolate: dented and ridged



I+ blue spot test: apply iodine solution (IKI), axis of *U. longissima* will turn blue.

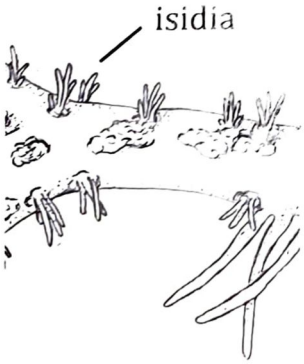
immediate coast: within approximately 1 mile (2 km) of the coast.

inflated: describes cigar-shaped branches that are puffed up above the pinched base.



isidia: vegetative reproductive propagules that look like short fingers and have a cortex so they are slightly shiny.

locally common: common in small or large areas but not common throughout the range.



medulla: the layer of fungal tissue and algal cells beneath the cortex. The medulla is usually soft and white. In this booklet, when referring to medulla, **dense** means fungal hyphae are packed close together; **loose** means fungal hyphae are cobwebby, with space between. **Thick** and **thin** refer to the width of the medulla in cross section.

oceanic: climate influenced by the Pacific Ocean, with warm summers and cool winters, with few temperature extremes.

oval soralia: in some species some of the soralia are oval with the long dimension along the branch length. {*diplotypus*}

P+: orange turning reddish in P (*p*-phenylenediamine) spot test.

papillae: small, even bumps on branch surface covered with cortex (no medulla visible).

pendulous: with long branches hanging down from substrate. Although these thalli must begin as short thalli, the main branches tend to be long and have less side branches than tufted thalli, even when young. {*filipendula,* upper left}

pseudocyphellae: pale, raised narrowly oval bumps, not on *Usnea*, but present on *Alectoria.*

sinuous: wavy as opposed to straight. {*cavernosa* - axis, *diplotypus*-branch}

soralia: openings in the cortex where soredia originate. Often these are circular, some are oval, and some merge to form large uneven shapes. Certain species form soralia that ring the branches. When notes mention > or < ½ branch diameter, not all will be that way. Look for an average of mature soralia.

soredia: vegetative propagules that are tiny balls of fungal hyphae and algae, without a cortex so they are not shiny. {*diplotypus*}

subpendant: thalli that begin as tufted thalli and become longer but not extremely long.

thallus: the whole *Usnea*, from branch tips to base.

tubercles: small bumps on branch surface, usually somewhat longer than wide, often with thin cortex that reveals medulla.

tuberculate soralia: soralia that originate on a tubercle so they are slightly raised up off the branch surface.

tufted: thallus that has many branches and often stands up on the substrate instead of hanging down. A mature, healthy tufted thallus makes a hemisphere. {*cornuta*, upper left}

UV+: medulla fluoresces brilliant white under short-wave UV lamp. If you are having trouble deciding if it is UV+ or UV–, it most likely is UV–. UV+ medulla is very obvious.

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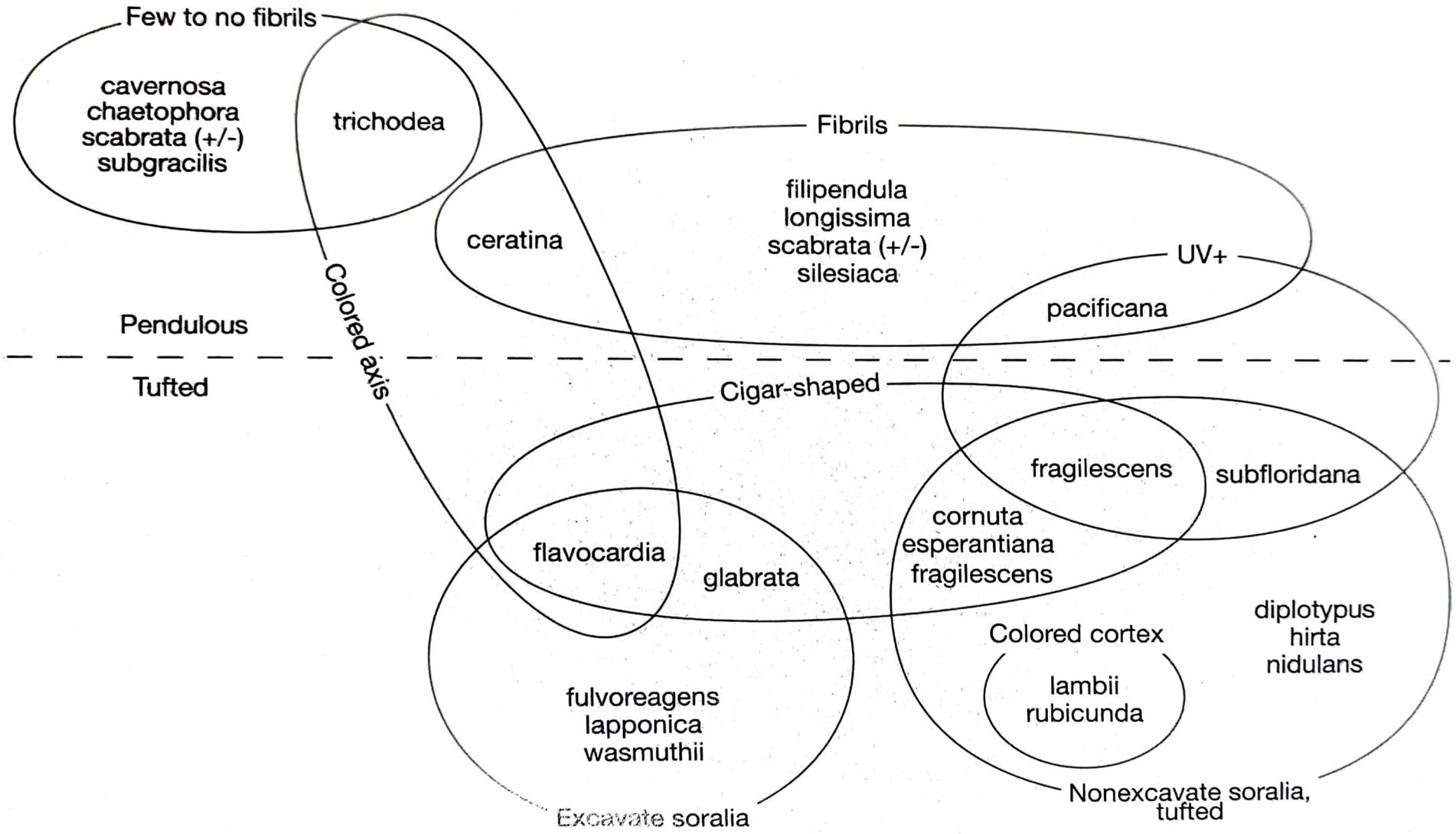
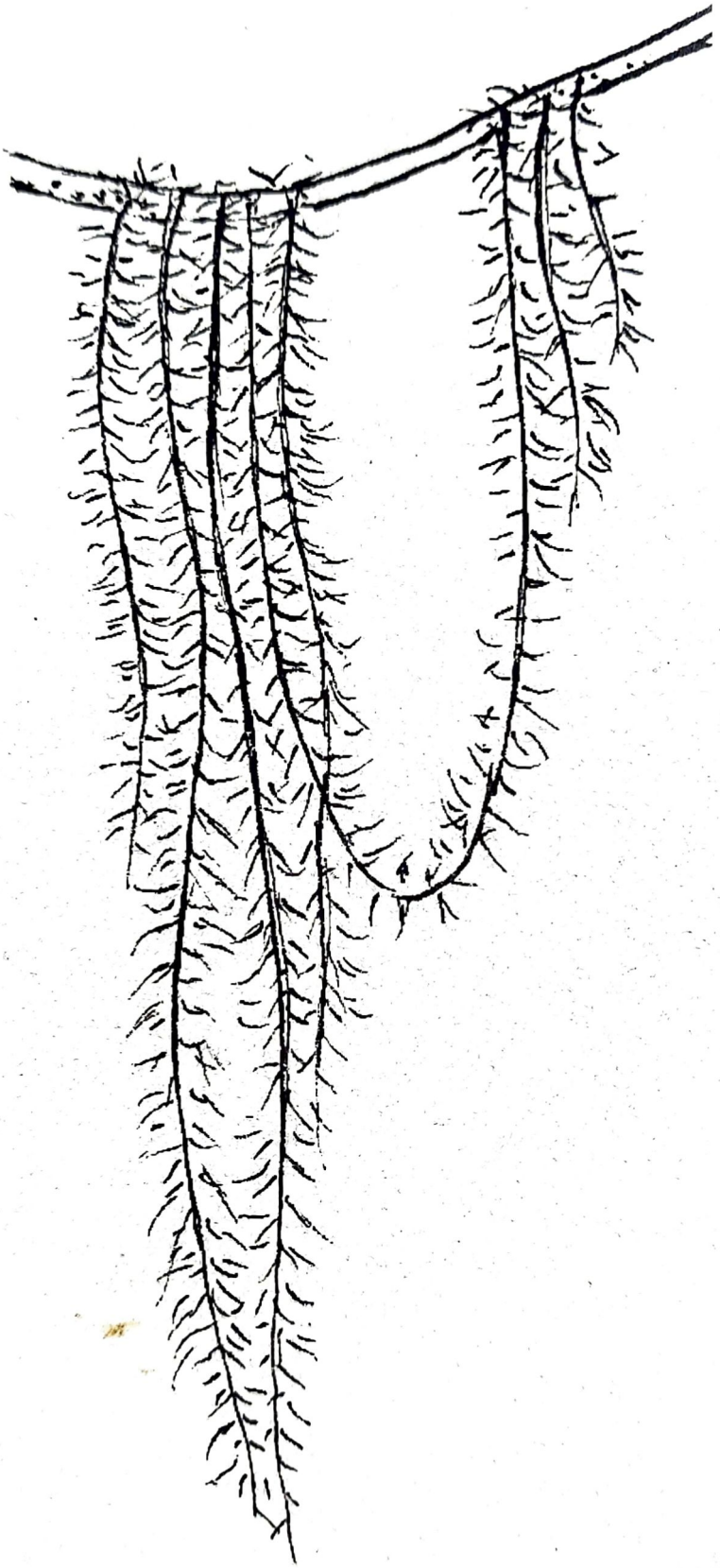

Few to no fibrils
cavernosa
chaetophora
scabrata (+/-)
subgracilis
trichodea
Fibrils
filipendula
longissima
scabrata (+/-)
silesiaca
ceratina
UV+
pacificana
Colored axis
Pendulous
Tufted
Cigar-shaped
fragilescens
subfloridana
cornuta
esperantiana
fragilescens
flavocardia
glabrata
diplotypus
hirta
nidulans
Colored cortex
lambii
rubicunda
fulvoreagens
lapponica
wasmuthii
Excavate soralia
Nonexcavate soralia,
tufted



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